PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : F01C 1/063

A1

(11) International Publication Number: WO 95/17582

(43) International Publication Date: 29 June 1995 (29.06.95)

(21) International Application Number: PCT/HU94/00059

(22) International Filing Date: 8 December 1994 (08.12.94)

(30) Priority Data:
P 93 03737 23 December 1993 (23.12.93) HU

(71)(72) Applicant and Inventor: JÁNOSI, Marcell [HU/HU]; 38 Pacsirtamező Street, H-1034 Budapest (HU).

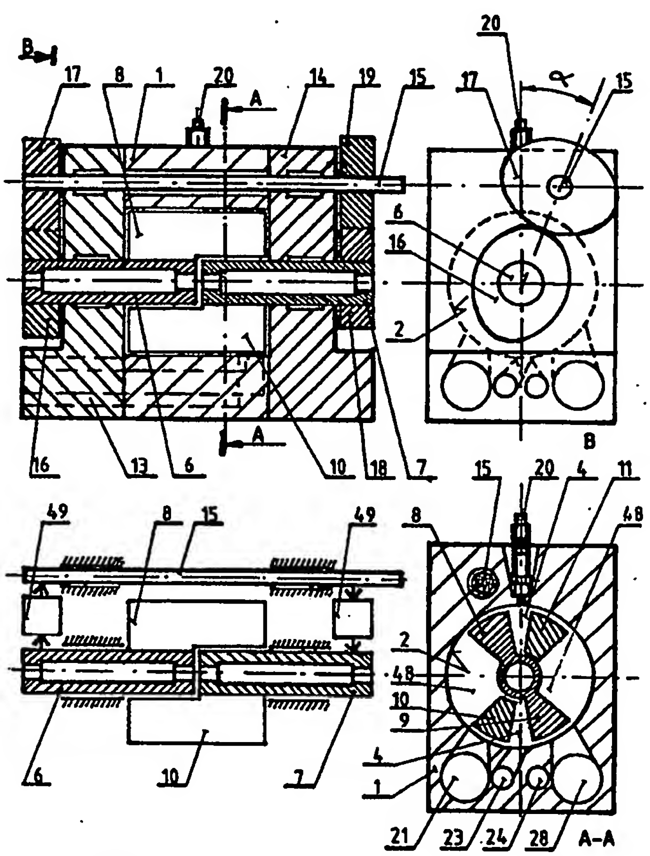
(81) Designated States: CA, CN, JP, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.
With amended claims.

(54) Title: ROTARY MOTION DRIVE, ESPECIALLY FOR INTERNAL COMBUSTION ENGINES

(57) Abstract

Rotary motion drive, which comprises rotor's housing (1), in which there are a cylindrical rotor's area (2) with inlet port and exhaust port. Two pairs of rotors which are rotatably mounted in the cylindrical rotor's area (2). Each rotor has a rotor's shaft (6, 7), which are fastened to two pairs of vanes (8, 9) and (10, 11). The cylindrical rotor's area (2) is divided by the neighbouring vanes to four working chambers (48), which are alternately expanded and then contracted. There is an output shaft (15) which is connected with rotor's shaft (6) and rotor's shaft (7) by at least two oval gears. Precisely, one oval gear (16) is fastened on the rotor's shaft (6). The other oval gear (18) is fastened on the rotor's shaft (7). Two oval gears (17, 19) are fastened on the output shaft (15). These oval gears (17, 19) are positioned 90° out of phase on the output shaft (15). The oval gear (16) is connected with the oval gear (17). The oval gear (18) is connected with the oval gear (19). These connections can be direct or an additional oval gear can be inserted.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria
AU	Australia
BB	Barbados
BE	Belgium
BF	Burkina Faso
BG	Bulgaria
BJ	Benin
BR	Brazil
BY	Belarus
CA	Canada
CF	Central African Republic
CG	Congo
CH	Switzerland
CI	Côte d'Ivoire
CM	Cameroon
CN	China
CS	Czechoslovakia
CZ	Czech Republic
DE	Germany
DK	Denmark
ES	Spain
FI	Finland
FR	France
GA	Gabon
GB	United Kingdom
GE	Georgia
GN	Guinea
GR	Greece
HU	Hungary
IE	Ireland
IT	Italy
JP	Japan
KE	Kenya
KG	Kyrgystan
KP	Democratic People's Republic of Korea
KR	Republic of Korea
KZ	Kazakhstan
LI	Liechtenstein
LK	Sri Lanka
LU	Luxembourg
LV	Latvia
MC	Monaco
MD	Republic of Moldova
MG	Madagascar
ML	Mali
MN	Mongolia
MR	Mauritania
MW	Malawi
NE	Niger
NL	Netherlands
NO	Norway
NZ	New Zealand
PL	Poland
PT	Portugal
RO	Romania
RU	Russian Federation
SD	Sudan
SE	Sweden
SI	Slovenia
SK	Slovakia
SN	Senegal
TD	Chad
TG	Togo
TJ	Tajikistan
TT	Trinidad and Tobago
UA	Ukraine
US	United States of America
UZ	Uzbekistan
VN	Viet Nam

ROTARY MOTION DRIVE, ESPECIALLY FOR INTERNAL COMBUSTION ENGINES

BACKGROUND OF THE INVENTION

1./ Field of the Invention

The present invention relates to the rotary drive, that is converting the petrol's energy into rotary motion or if it is rotated by electrical propulsion, it can convert the rotary motion into pressure energy. Its application field is first of all the internal combustion engine, but we can apply in other fields, too. The principle of the rotary drive is applicable for motors or pumps. (The medium can be: petrol, steam, compressed air and oil). The rotary drive is very simple. It has a pair of concentric rotors and one output shaft, all of the three are connected to each other by different solutions.

2./ Brief Description of the Prior Art.

The idea of rotary drive is very old and well known. The first invention was in 1906 /No 826.985 USA, D. APPEL/ and nowadays hundreds of the same invention are published. Some of them are as follows:

- PCT WO 90/07632 Energy converting machine.
  Priority data 09.11.1989.

- USA 5112204 Oscillatory rotating engines...
  Foreign Application Priority data 15.11.1989.

- EPA 0554227A1 Engine with rotary pistons...
  Priority data 30.01.1992.

The principle of operation is common in all the above inventions: The rotary drive has two rotors and one output

shaft to be driven by two rotors.
A cylindrical housing comprises a pair of concentric rotors, each rotor has two vanes. The rotors are rotating with varying speed. The movable combustion chambers are defined by all of two neighbouring vanes, running after one another with cyclically changing speed, in order to periodically approach and move away from one another. The four neighbouring vanes define four working chambers in a cylindrical housing: their relative speed varying, so that the volume of each working chamber is alternately expanded and then contracted. An inlet port, exhaust port and ignition device are provided at appropriate points on the cylindrical housing, so that the expansion and contraction of the working chambers will provide induction, compression expansion and exhaust strokes.

The solution of speed variation aren't common in all inventions:
- They are different from each other in mechanical solution
- Their speed characteristic are consequently also different from each other

There are three important components of such drives:
- two rotors
- one output shaft
Accordingly, nowadays the main question is:
How should we connect the three important components to each other?

The solution has to fulfil the following requirements:
- has to be simple and robust
- number of components has to be as low as possible
- dimensions and weight reduction ("down sizing")
- preferably no application of eccenter, crankshaft*
- preferably no application of linkage, piston's rod*
- preferably no application of internal gears*
- a good thermodinamical efficiency has to be reached

- five side of the cubical housing of drive should be free for other subassemblies*
- the balancing problems have to eliminated*
- the combustion process has to be equivalent to that of a four-stroke eight cylinder engine. /Eight explosions during two revolutions of output shaft/.

*The above requirements haven't been fulfilled totally by the known inventions, till now.

OBJECTS AND SUMMARY OF THE INVENTION

The object of the present invention is to provide a new rotary drive for internal combustion engines or for pumps. The key of the new rotary drive is a new connective system. This new connective system will determine and will provide every main performance of the new rotary drive. The new rotary drive is inseparable from this new connection system. Accordingly, more precisely, the object of the present invention is to provide a new rotary drive by a new connective system, which fulfils the requirements presented at the end of the previous chapter.

In the first step we have to clear some theoretical questions, as follows:

- the rotor's speed characteristic, what we can reach theoretically
- the minimum number of components, what we can reach theoretically
- the smallest external dimension, what we can reach theoretically

Rotor's speed characteristic (restrictions and possibilities).

There are two restrictions of the rotor's speed characteristic. The time of one revolution is $T=\frac{60}{n_o}$, where the "n_o" is the output shaft's revolution per minute. Accordingly, the periodic time of rotor's speed

characteristic is $\frac{T}{2}$, this is the first restriction. The speed characteristic of the rotor has to fulfil the following equivalent: $\frac{n_x}{n_{(x+\frac{T}{4})}}$

this is the second restriction, where n_x is the r.p.m. of rotor in the "x" time, $n_{(x+\frac{T}{4})}$ is the r.p.m. of rotor in the "$x+\frac{T}{4}$" time.

There are three possibilities:

- depend on max output r.p.m., we can choose the convenient acceleration $\frac{dn}{dt}$
- the run up and run down of speed can be the same $\left|\frac{dn}{dt}\right| = \left|-\frac{dn}{dt}\right|$ (the characteristic can be symmetrical).
- between the + $\frac{dn}{dt}$ and the - $\frac{dn}{dt}$, the acceleration can be "0" for a long time (about for $\frac{T}{36}$)

These possibilities are theoretical of course.

The minimum number of components (we can reach theoretically).

Let's consider those group of the elements of the drive as one component, which do not moving independently from each other (e.g. there is a shaft with two fastening wheels, this group of three elements is one component, if the wheels aren't rotatable or movable independently on the shaft).

Accordingly, rotary engines has four unavoidable components: a housing (not moving), one output shaft (with constant speed) and two rotors (with cylindrically varying speed).

The smallest external dimension.

An engine is defined by so called "capacity" (surface of bore x stroke x number of cylinder) as an example we will calculate with 1000 cm^3 net capacity. We add to that the

necessary compression area about 100 cm^3, so we have now 1100 cm^3, as an internal capacity. The shape of this internal capacity is cylindrical. We make a cubical theoretical engine, the thickness of its walls is one centimetre. The external sizes of this cubical engine are the followings: 13,2 cm x 13,2 cm x 13,2 cm = 2300 cm^3.

These external sizes are including the following:

engine's capacity	1000 cm^3
compression's capacity............................	100 cm^3
volume of the walls..............................	1200 cm^3
pistons, shafts, piston's rods, crankshafts, valves, springs and others components...........	0 cm^3
	2300 cm^3

Of course, the other assemblies (carburetter, cooling system, compression system, transmission, gearbox, generator, starter motor and other assemblies) don't belong to the present invention.

The 2300 cm^3 is the gross external volume of a theorical engine, on which we don't apply any components besides the housing. The average gross external volume of the present manufactured engines is about 15.000 cm^3 per 1000 cm^3 net capacity.

In the second step we are presenting the invention.

The general solution of rotary drive is that, we connect the output shaft to each rotor with two cyclically varying transmissions, which are at the same execution and are positioned 90° out of phase on output shaft. The periodically varying transmission is producing two different ratio, which are alternating during $\frac{T}{4}$ time, where the whole periodic time is $\frac{T}{2} = \frac{30}{n_o}$ (n_o is the r.p.m. of output shaft). One of the ratios is $\frac{n_{max}}{n_o}$ (about 1,5-2) the other is $\frac{n_o}{n_{max}}$ (about 0,66-0,5). This is a principal solution.

Every main performances of new rotary drive is decided by the real solution of periodically varying transmission. One of the real elegant solutions is the use of two pairs of oval gears, which are fastened on the output shaft and on the rotors. The realisable rotary drive is detailed as follows:

- the working chamber must be cylindrical
- in this cylinder there are two rotors, on each rotor there are two vanes (or blades, or pistons) and an oval gear
- the shape of gears is oval (elliptical) $\frac{R_{max}}{R_{min}}$ ratio $< \frac{1,7}{1}$ are suggested (by inventor)
- there is an output shaft with two oval gears, which are positioned 90° out of phase on the output shaft
- the working chamber has a vacumic pipe (between the exhaust and inlet ports) to clean up the remaining pollutant emissions (after the exhaustion).
- each rotor's oval gear is connected to the oval gear of output shaft.

The above solution provide the fulfilment of all requirements (see 2-3 pages), all restrictions (see 4 page) and reaches nearly all theoretical possibilities. The summary of the results is the following:

- the drive is simple and robust there are only three unavoidable rotary components and a housing without any other motion component
- there is minimum number of components (there aren't camshaft, valves, spring for valves, exhaust manifold, inlet manifold etc)
- external volume is very small (about 5000 cm^3 /1000 cm^3/
- there aren't eccenter and crankshaft
- there aren't link age and piston's rod
- there aren't internal gears
- we can reach a good thermodinamical efficiency by good rotor's speed characteristic, that is symmetrical, straight for a long period, and its acceleration is variable to a certain extent, and a new process is

inserted between the exhaust port and inlet port (so called "rinse stroke")

- we left five side of the cubical housing free for other assemblies
- the drive hasn't balancing problems
- the combustion process of drive is equivalent a four-stroke, eight cylinder engine. In addition it has a "fifth stroke" that is called "rinse stroke"
- there isn't changing direction of rotary components

In the following we like to present the calculation of rotary drive with oval gears (for technicians):

The oval gear.

The oval has two axes, which are perpendicular to each other. The lengths of axes are: $2R_{min}$ and $2R_{max}$ and the other radii are between R_{min} and R_{max}. The axial distance of the two oval gears is C = constant:

$C = R_{min} + R_{max} = R\alpha_x^\circ + R\beta_x^\circ$ This is the first restrictions for oval gears,

where α_x° is the position angle of the driving gear which is between R_{min} and $R\alpha_x^\circ$

β_x° is the position angle of the driven gear, which is between R_{min} and $R\beta_x^\circ$

$L\alpha_x^\circ = L(90^\circ - \beta_x^\circ)$ This is the second restriction for oval gears,

where $L\alpha_x^\circ$ = length of curve (which belongs to α_x°) and

$L_{(90^\circ-\beta_x^\circ)}$ = length of curve (which belongs to $(90^\circ-\beta_x^\circ)$)

Average ratio:

if the driving oval gear turns away an angle 45° /from 0°-to α_{45}° /

when the driven oval gear turns away an angle ε° and the average ratio is $\frac{1}{i_1} = \frac{\varepsilon^\circ}{45^\circ}$

if the driving oval gear turns away further angle 45° (from α_{45}° -to α_{90}°)

when the driven oval gear turns away an angle ($90° - \varepsilon°$) and

the average ratio is $\frac{1}{i_2} = \frac{90° - \varepsilon°}{45°}$

The rotor's vane (blade)

The theoretical size of the rotor's vane (in angle grad) is $\gamma_t° = 2\,\varepsilon°$

The real size of the rotor's vane (in angle grad) is

$\gamma° = 2\varepsilon°$ - compression capacity

compression capacity= $\frac{180° - 4\varepsilon°}{\text{compr. ratio} - 1}$ /in angle grad/

accordingly $\gamma° = 2\varepsilon° - \frac{180° - 4\varepsilon°}{\text{compr. ratio} - 1}$

The theoretical power of rotary drive (the calculation method is the same as that of the well known four-stroke engines) is $N = \frac{n_o \cdot P_i \cdot L \cdot \pi \cdot (D^2 - d^2) \cdot (1 - \frac{\varepsilon°}{45°})}{900000}$

Where P_i = average indication pressure (kg/cm^2)

D = rotor's diameter /cm/

d = shaft's diameter of rotor /cm/

L = length of rotor vane /cm/

$\frac{\varepsilon°}{45°}$ = average ratio of the last oval gear /1 /

n_o = output shaft r.p.m. /$\frac{1}{min.}$/

N = power of drive /$\frac{75m}{kg}$/

DESCRIPTION OF THE DRAWINGS

Figure 1 shows a therortical engine with a stroking chamber capacity of 1000 cm^3 and a compression area of 100 cm^3. The sum of this unavoidable capacity is 1100 cm^3, its shape is cylindrical and it is built into a cubical casing. This is the "engine" which has the smallest external volume, theoretically.

Figure 2 shows a vertical section and a cross section and a principal scheme of the simplest rotary drive.

Figure 3 shows a vertical section and a cross section of the rotary drive with double oval gear and with coaxial output shaft.

Figure 4 shows two vertical section and an elevation of the one-sided rotary drive, with double oval gear and with

coaxial output shaft.

Figure 5 shows a vertical section and an elevation of the two-sided rotary drive, with oval-curve solution.

Figure 6 shows a vertical section and an elevation of the two-sided rotary drive with two external gears.

Figure 7 shows a vertical section and two exploded views of the rotor's vanes in the one of embodiments.

Figure 8 shows two vertical section and two exploded views of the rotor's vanes.

Figure 9 shows a vertical and an elevation of four rotary drives built in a common housing.

Figure 10 shows a modified drive, which can be operated by steam or compressed air.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Figure 1 shows the theoretical limit of the external volume of the internal combustion engine. Of course this theory is based on some subjective restrictions; e.g. the compression ratio is 10:1, the thickness of wall is 1 cm and etc. We can see this theoretical engine built in a cubical casing 5, which has an external volume of 2300 cm^3 its wall thickness is 1 cm and the cylindrical total capacity is 1100 cm^3 from the net capacity of 1000 cm^3 and the 100 cm^3 compression area 4. This "engine" is equal to a four stroke, 1000 cm^3 capacity engine without the unavoidable operating components. This theoretical engine hasn't got any operating components, only one empty stroking chamber 3. Of course, a real working engine of 1000 cm^3 has never reached the the external volume of 2300 cm^3, but we can hope this new rotary drive can reach an external volume of 5000 cm^3/1000 cm^3 working chamber.

In the figure 2 we are showing a simplest embodiment of the rotary drive. In the vertical section and in the "A" cross section we can see in the rotor's housing 1 the cylindrical rotor's area 2 and in it there is the rotor shaft 6, on which the rotor's vane 8 and the rotor's vane 9 are fastened. In the same way there is the rotor's

shaft 7, on which the rotor's vane 10 and the rotor's vane 11 are fastened. The cover 13 and the cover 14 are fastened to the rotor's housing 1. The covers and the rotors housing 1 define the cylindrical rotor's area 2. In the principal scheme we can see two principal transmissions 49, which are connected to the output shaft 15 and to the rotor's shaft 6 and to the rotor's shaft 7. In the real embodiment, there are two pairs oval gears 16, 17, 18, 19 which are connected to each other, more precisely, two oval gears 17, 19 are connected to the output shaft 15 and the oval gear 16 is connected to the rotor's shaft and the oval gear 18 is connected to the rotor's shaft 7. The oval gear 17 and the oval gear 19 are positioned 90° out of phase on the output shaft 15, from each other. In the elevation we can see the connection between two oval gears 16, 17. The α angle is only one possibility to the decreasing of sizes. In the "A" cross section, the output shaft 15 is turned back by 45° from the position on the elevation, in order to show the moment of an explosion. In the compression area 4, we can see the ignition spark plug 20, and in opposite are the vacumic pipe 23 and the fresh-cooling air pipe 24, so clean up the remaining pollutant emissions after exhaust stroke. Next to them, there are the inlet port 21 and the exhaust port 22. In the "A" cross section shows the moment of the starting explosion. The moment that, the following working process are starting;

- in the compression area 4 (at the top, next to the spark plug 20) the combustion process starts (expansion-stroke)
- in the opposite side, in the other compression area 4 (at the bottom) the clean process goes (the vacumic pipe 23 and the fresh-cooling air pipe 24 have opened and started the rinse) (rinse-stroke)
- after the vacumic pipe 23 is closed by the rotor's vane 9, the suction process will start from the inlet port 21 (induction-stroke)
- in the working chamber 48 (on the right) the exhaust

process starts.
(exhaust-stroke)
- in the opposite side, in the other working chamber 48, the compression process starts.
(compression-stroke)

The above processes are repeated four times per one revolution of output shaft 15, according to the position of the oval gears 17, 19.

The solution, which we can see in the Figure 3 differs from Figure 2, because its transmissions are built up two pairs of oval gears per side. This solution gives a possibility; the output shaft 15 can be located in the centre of the rotor's shaft 6. The oval gear 16 is fastened on the rotor's shaft 6. The double oval gear 12 is connected to the oval gear 16. The two oval gears of the double oval gear 12 are positioned 90° out phase from each other. The shaft 25 is fastened on the cover 13 and the double oval gear 12 is rotatably mounted on the shaft 25. The double oval gear 12 is driving the oval gear 17, which is fastened on the output shaft 15. In the Figure 3 we can see the rotor's housing 1, in which the cylindrical rotor's area 2, the compression area 4 and the working chamber 48 are located. All others components are operating in the same way, which have already presented before in Figure 2.

The Figure 4 shows a one-sided solution, which is preferable to the double sided solution to present before, because much more place remains to mount other subassemblies to the drive. Further preferable of this solution, the all oval gears are mounted on one place, and the mounting and the oil-, inlet-, exhaust- and cooling systems will be simpler. The one-side solution is the following: two shaft 30 are fastened on the cover 14. The output shaft 15 is located on the cover 14 too. The three shaft are composed angle of 90°, where the output shaft 15 is in the centre, we can see this in the "D" elevation. There are mounted the rotor's shaft 26, 27 in the centre. The oval gear 16 is fastened on the rotor's shaft 26. The double oval gear 28 is connected to the oval gear 16. The

oval gear 17 is fastened on the output shaft 15. The oval gear 17 is connected to the double oval gear 28. The oval gear 18 is fastened on the rotor's shaft 27. The double oval gear 29 is connected to the oval gear 17 and to the oval gear 18.

In the **Figure** 5 we present the solution of the oval curve, which is instead of the solution of the oval gear. This solution doesn't use gears, but use some roads and one oval curve. The cover 13 comprises the oval curve 37. The disk 34 is fastened on the rotor's shaft 6. The disk 33 is fastened on the output shaft 15. The puller rods 31 are connected to the disk 33 and to the pins 35. The pusher rods 32 are connected to the disk 34 and to the pins 35. The rollers 36 are placed free-wheeled on the pins 35. The rollers 36 can be moving according to the oval curve, if the output shaft 15 is rotating with constant speed and the output shaft 15 is connected to the rotor's shaft 6, making use of the puller rods 31 and of the pusher rods 32, when the rotor's shaft will be rotating with cyclical varying speed. The rotor's shaft 6 will be periodically accelerating and retarding according to the position of the output shaft 15. The performance of this solution can reach as such the level as possible with the oval gear.

On the base of this principle, the rotor shafts 6, 7 and the output shaft 15 are connected each other by the rods and the oval curve on the one-side. The oval curve and the roads (without gears) give the solution to the connection, which is necessary between output shaft 15 and two rotors 6, 7.

The **Figure** 6 shows an other curve solution with two gears. The gear 38 is fastened on the rotor's shaft 6. The gear 39 is locating in the cover 13. The output shaft 15 is located inside of the gear 39, but eccentrically. Its eccentricity is "e". The output shaft 15 is locating in the rotor's housing 1. The inside of the disk 41 has an curve which is represented in a straight line. But the forme of this curve can be at optional. The roller 40 can be moving in this curve. The roller 40 is located rotatably on the

side of gear 39. The disk 41 is fastened on the output shaft 15. If the output shaft 15 turns with constant speed, the disk 41 is the driving wheel and the gear 39 is the driven wheel. The disc 41 and the gear 39 are connected by the roller 40. The gear 39 is connected to the gear 38. The ratio is 1:2. According to the position of the output shaft 15, the rotor's shaft 6 is rotating alternately with varying speed. Of course, only one side is represented by figure 6, but the rotary drive is built up two sides. The two side are making in the same way, but they are mounted with two roller 40, which are positioned 180^d out of phase from each other.

The Figure 7 shows the two rotors. We can see in exploded views two rotor's shaft 6, 7 which are located in one axis. The rotor's vanes 8, 9 are fastened on the rotor's shaft 6. The rotor's vanes 10, 11 are fastened on the rotor's shaft 7. Restriction is the two sizes marked by L and L/2. The Figure 8 shows an other solution, this is very usable for longer size of L, because the distribution of the working load is uniform. The rotor systems contain more elements. The rotor's vanes 8, 9 are fastened on the rotor's shaft 26. There is necessary two uniform pieces of them. The rotor's vanes 10, 11 are located on the rotor's shaft 27. There is necessary one piece of them. Restrictions are the four sizes, marked by ϕA, ϕA, ϕd<ϕD. The Figure 9 shows a rotary drive with four rotors, where the four rotors are built in a common housing 43. There are four cylindrical rotor's area 2 in a common housing 43. The common housing is closed by the common covers 44, 45. The "B" elevation presents the four gears 42, which are connected to each others. Precisely, four gears 42 are fastened on the four rotor's shaft. The oval gear 18 is fastened on the output shaft 15 (the other oval gear 18 is fastened on the other end of the same output shaft 15, but it is positioned 90^d out of phase on the output shaft 15). The oval gear 17 is rotatably located on the rotor's shaft. The oval gear 16 is fastened on the rotor's shaft. The oval gears 16, 17, 18 are connected to each other. All other

operations are in the some way, which have already presented before in Figure 2.

The Figure 10 shows a cross section of the rotary drive, which is applicable for other mediums (e.g. steam or compressed air). We can see the location of high pressure pipe 46 and the location of low pressure pipe 47. The driving medium is arriving in the high pressure pipe 44 and after expanding the "tired" medium is moving off in the low pressure pipe 47.

CLAIMS

1. Rotary motion drive, which comprises rotor's housing (1), in which there are a cylindrical rotor's area (2) with inlet port and exhaust port, two pairs of rotors which are rotatably mounted in the cylindrical rotor's area (2); each rotor has a rotor's shaft (6, 7), which are fastened to two pairs of vanes (8, 9) and (10, 11), the cylindrical rotor's area (2) is divided by the neighbouring vanes to four working chambers (48), which are alternately expanded and then contracted, and there is an output shaft (15); this rotary motion drive being characterised by;
the said output shaft (15) being coupled with said rotor's shaft (6) and said rotor's shaft (7) by at least two oval gears, precisely, one said oval gear (16) being mounted on said the rotor's shaft (6) and the other said oval gear (18) being mounted on rotor's shaft (7), and two said oval gear (17, 19) being mounted on the output shaft (15), these said oval gears (17, 19) are positioned 90° out of phase on the output shaft (15), the said oval gear (16) being coupled with said oval gear (17) and said oval gear (18) being coupled with said oval gear (19), these said connections having a such formation, that provides an alternating movement between the said two rotors, these said connections can be direct or an additional said oval gear can be inserted e.g. the double said oval gear (12); the rolling or pitch curve of these said oval gears is the same, and it has to fulfil two said restrictions; first restriction is this;
$R_{min} + R_{max} = R\alpha_x^\circ + R\beta_x^\circ$ where $R\alpha_x^\circ$ = radius of driving oval gear, $R\beta_x^\circ$ = radius of driven oval gear, where α_x° and β_x° are the position angles, which are between R_{min} and $R\alpha_x'$ or $R\beta_x^\circ$, if they are=R_{min}, when α_x° and β_x° are="0"; second restriction is this; $L\alpha_x^\circ = L(90^\circ - \beta_x^\circ)$ where "$L\alpha_x^\circ$" is length of the curve, which belongs to α_x, "$L(90^\circ - \beta_x^\circ)$" is length of the curve, which belongs to $(90^\circ - \beta_x^\circ)$.

2. Rotary motion drive according to claim 1, wherein the said output shaft (15) is placed coaxially in the centre of said rotor's shaft (6) and said oval gear (17) being

mounted on said output shaft (15), and the said oval gear (16) being mounted on said rotor's shaft (6), the said double oval gear (12) being coupled with said oval gear (16) and said oval gear (17).

3. Rotary motion drive according to claims 1 and 2, wherein the said output shaft (15) being placed on said common cover (45), the oval gear (18) is mounted to said output shaft (15) and the oval gear (16) is mounted to the rotor shaft (6), and the oval gear (17) is a said connection between said oval gear (16) and said oval gear (18), the centres of three said oval gears (16, 17, 18) have to constitute an isosceles right-angled triangle.

4. Rotary motion drive according to claim 1 wherein there are the said vacumic pipe (23) and the said fresh-cooling air pipe (24), their position is the opposite of spark plug (20).

5. Rotary motion drive according to claim 1, in which there is an said oval curve (37) instead of the oval gears, the said oval curve (37) is fastened on the rotor's housing, the roller (36) can be moved on the restricted way of said oval curve (37), the roller (36) being rotatably mounted on said puller rod (31) and on said pusher rod (32), the puller rod (31) is turnably and tangentially mounted for said disk (33) which is fastened on the output shaft (15), the pusher rod (32) is turnably and tangentially mounted for the disk (34) which being mounted on rotor's shaft (6).

6. Rotary motion drive according to claim 1, in which there are two external gears (38, 39) instead of the oval gears, the said gear (38) is mounted on the rotor's shaft (6), the said gear (39) is rotatably mounted on the cover (13), the ratio is 2:1 between said gear (38) and said gear (39), the output shaft (15) is rotatable mounted in the rotor's housing (2), the position of the output shaft (15) being placed eccentrically at the centre of said gear (39), the roller (40) is rotatably mounted on the side of said gear (39), the said roller (40) is connected with the disc (41) which is fastened on output shaft (15).

AMENDED CLAIMS

[received by the International Bureau on 22 May 1995 (22.05.95);
original claims 3,5 cancelled;
original claim 1 amended;
remaining claims unchanged (1 page)]

1. Rotary motion drive, which comprises rotor's housing (1), in which there are a cylindrical rotor's area (2) with inlet port and exhaust port, two pairs of rotors which are rotatably mounted in the cylindrical rotor's area (2); each rotor has a rotor's shaft (6, 7), which are fastened to two pairs of vanes (8, 9) and (10, 11), the cylindrical rotor's area (2) is divided by the neighbouring vanes to four working chambers (48), which are alternately expanded and then contracted, and there is an output shaft (15); this rotary motion drive being characterised by;
the said output shaft (15) being coupled with said rotor's shaft (6) and said rotor's shaft (7) by at least two oval gears, precisely, one said oval gear (16) being mounted on said the rotor's shaft (6) and the other said oval gear (18) being mounted on rotor's shaft (7), and two said oval gear (17, 19) being mounted on the output shaft (15), these said oval gears (17, 19) are positioned 90° out of phase on the output shaft (15), the said oval gear (16) being coupled with said oval gear (17) and said oval gear (18) being coupled with said oval gear (19), these said connections having a such formation, that provides an alternating movement between the said two rotors, these said connections can be direct or an additional said oval gear can be inserted e.g. the double said oval gear (12); the rolling or pitch curve of these said oval gears is the same, and it has to fulfil the following requirements;
the oval curve has to contain convex arc and concave curve, therefore, the engagements of the two oval gears are alternately an internal-external engagement of the cog-wheels and then an external-external engagement of the cog wheels.

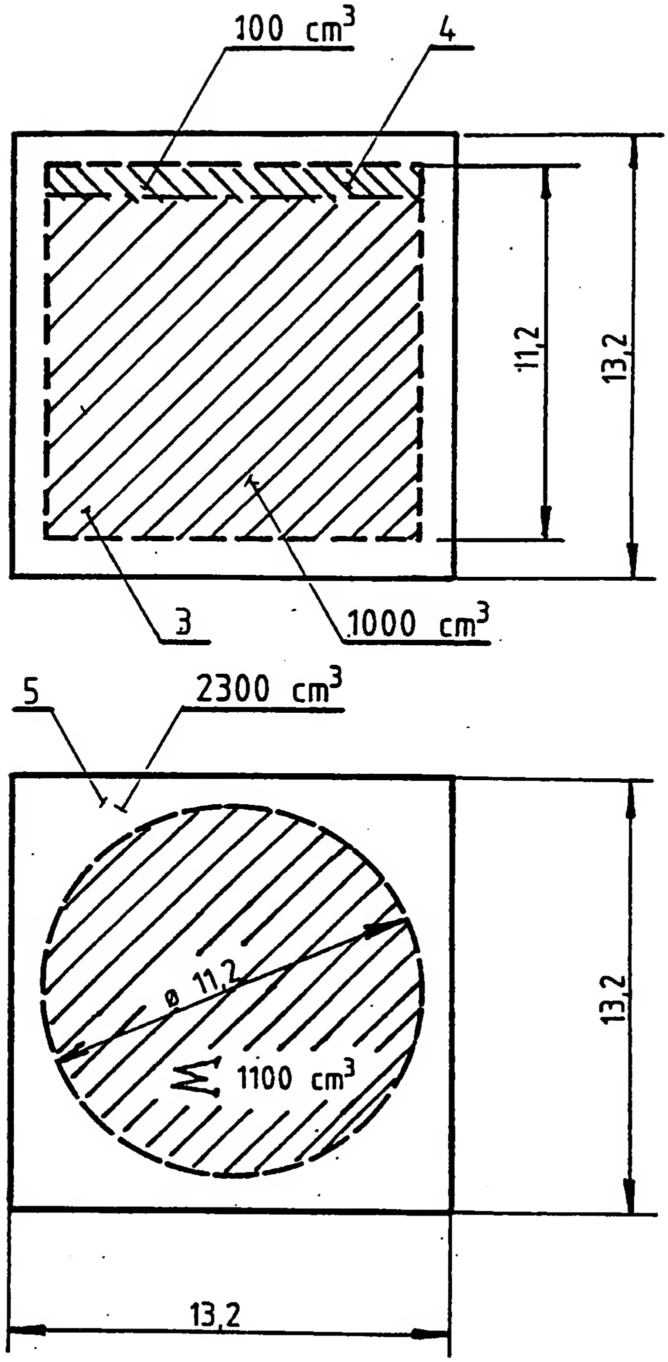


FIGURE 1

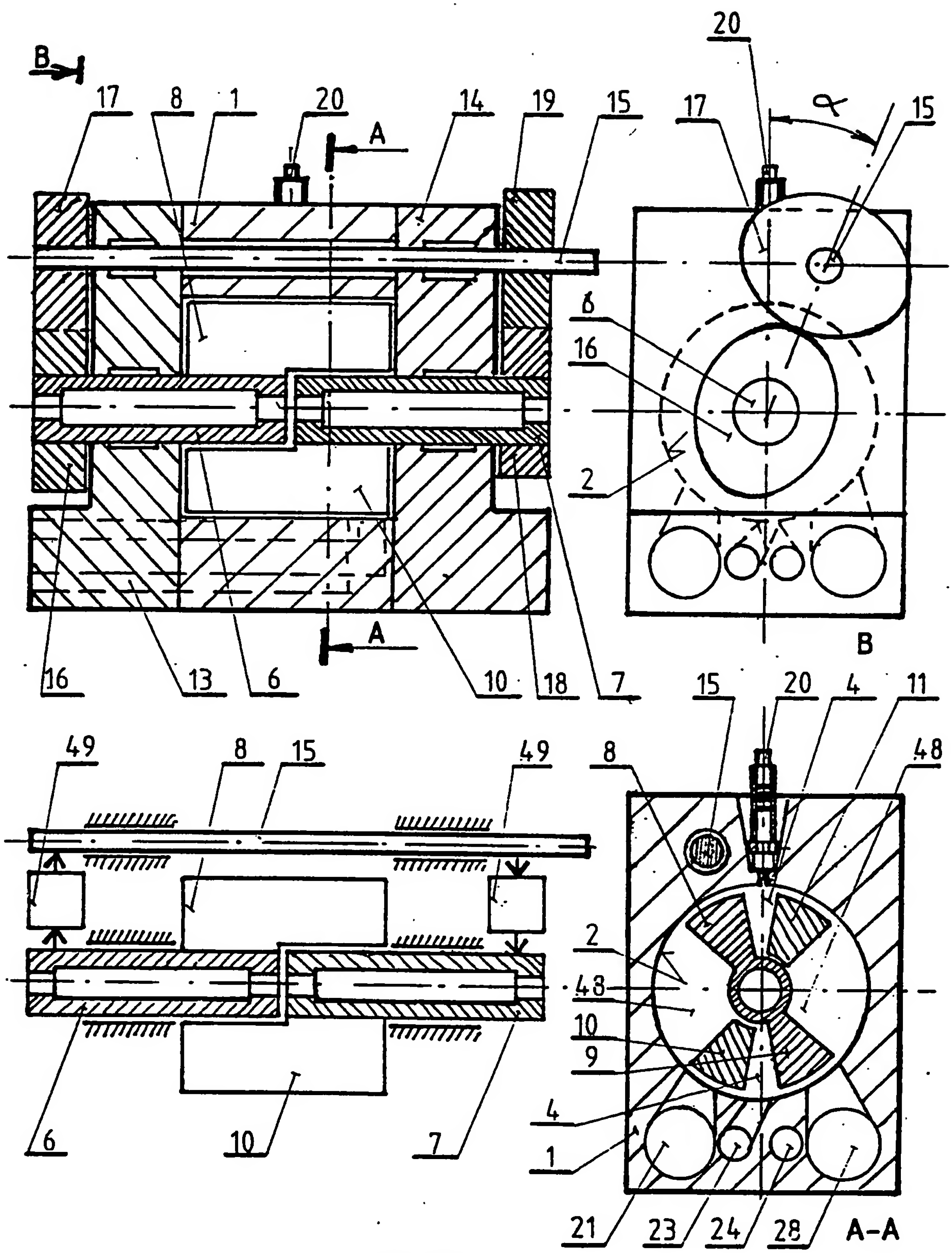

B
17
8
1
20
A
14
19
15
17
20
α
15
6
16
2
16
13
6
A
10
18
7
B
15
20
4
11
49
8
15
49
8
48
2
48
10
9
4
1
6
10
7
21
23
24
28
A–A

FIGURE 2

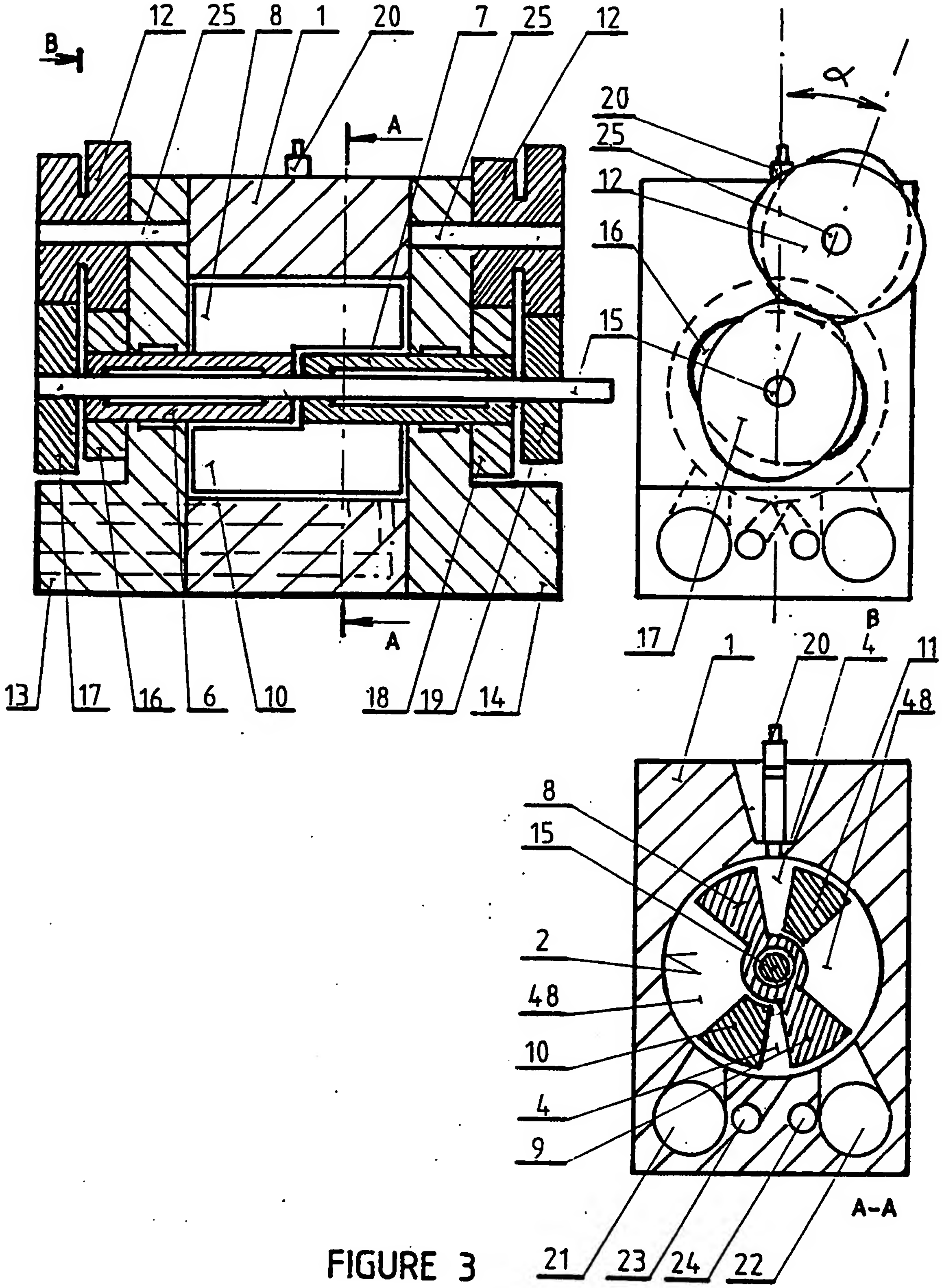
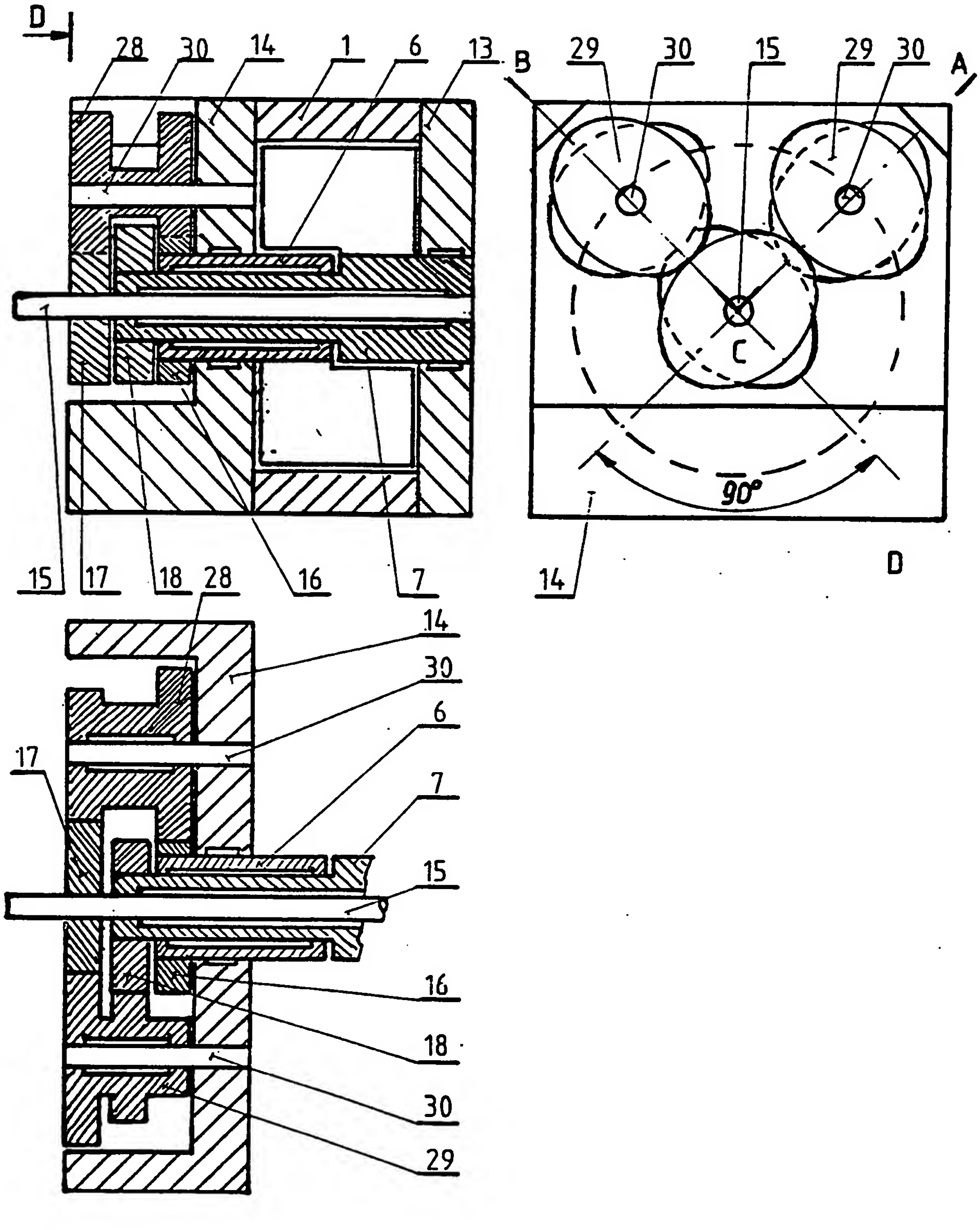

B
12
25
8
1
20
7
25
12
A
A
13
17
16
6
10
18
19
14
α
20
25
12
16
15
17
B
1
20
4
11
48
8
15
2
48
10
4
9
A–A
21
23
24
22

FIGURE 3


D
28
30
14
1
6
13
B
29
30
15
29
30
A
C
90°
15
17
18
28
16
7
14
D
14
30
6
17
7
15
16
18
30
29

A-C-B

FIGURE 4

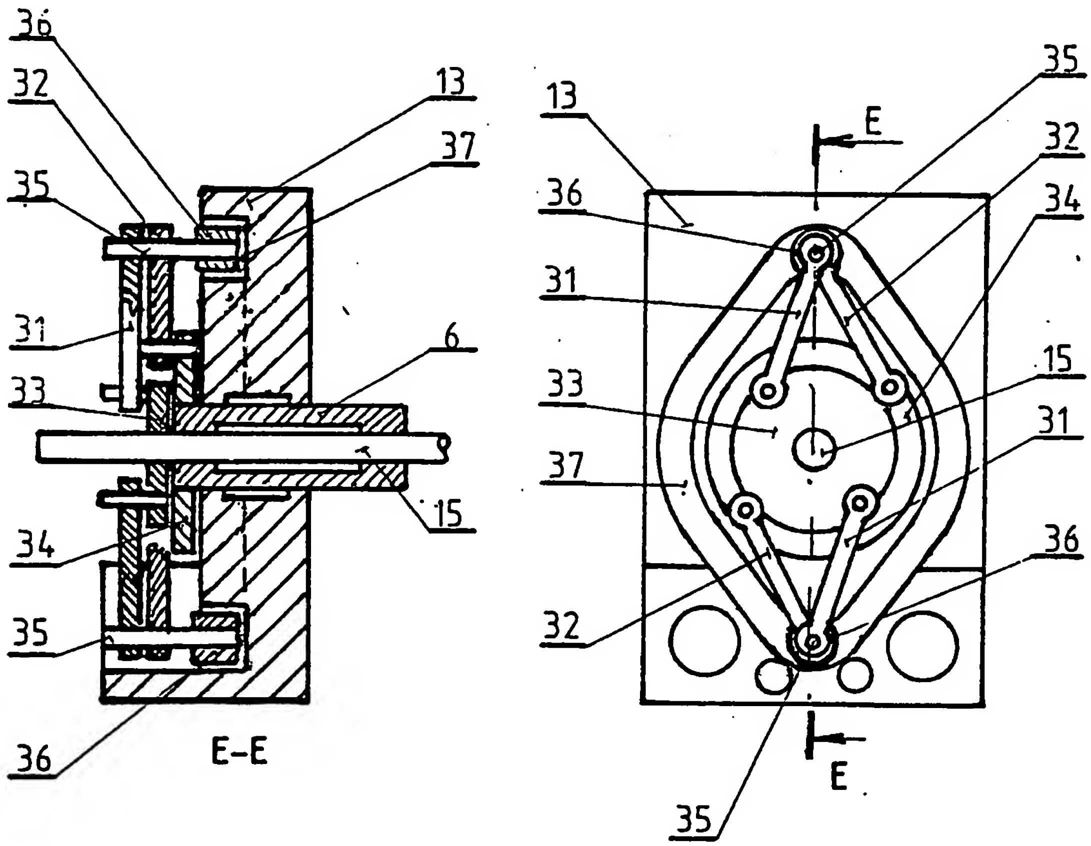

36
32
35
31
33
34
35
36
13
37
6
15
E–E
13
36
31
33
37
32
35
E
E
35
32
34
15
31
36

FIGURE 5

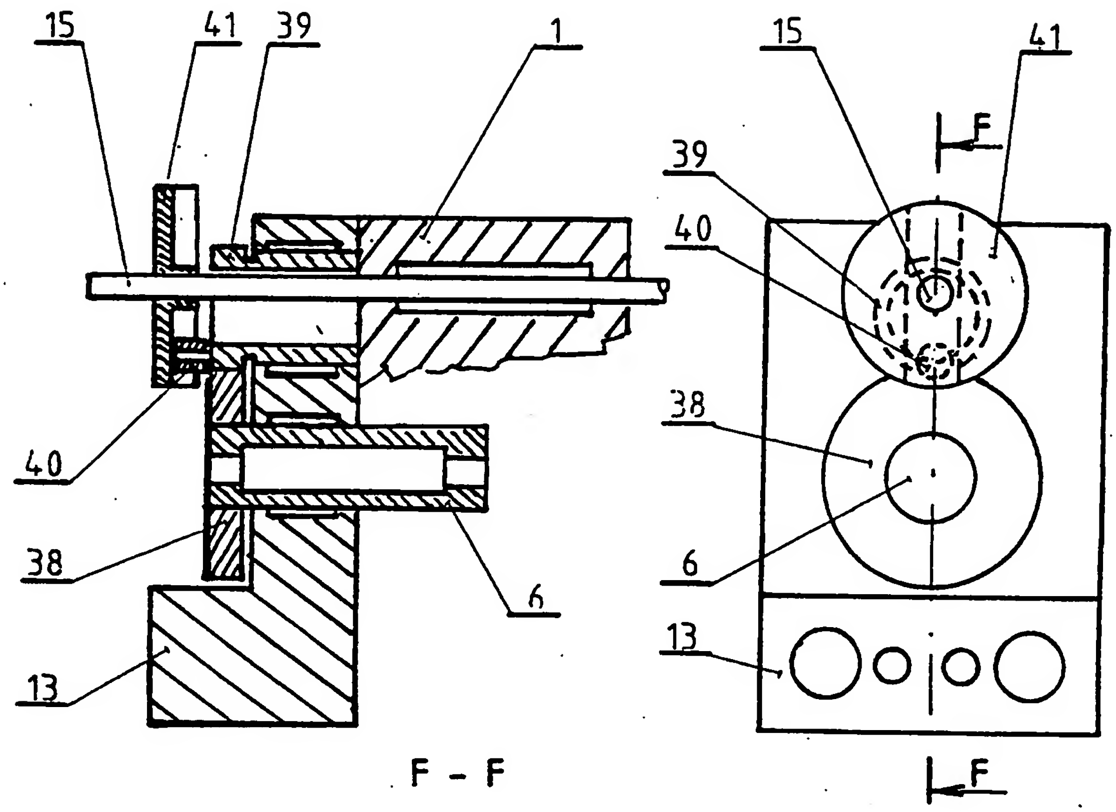


FIGURE 6

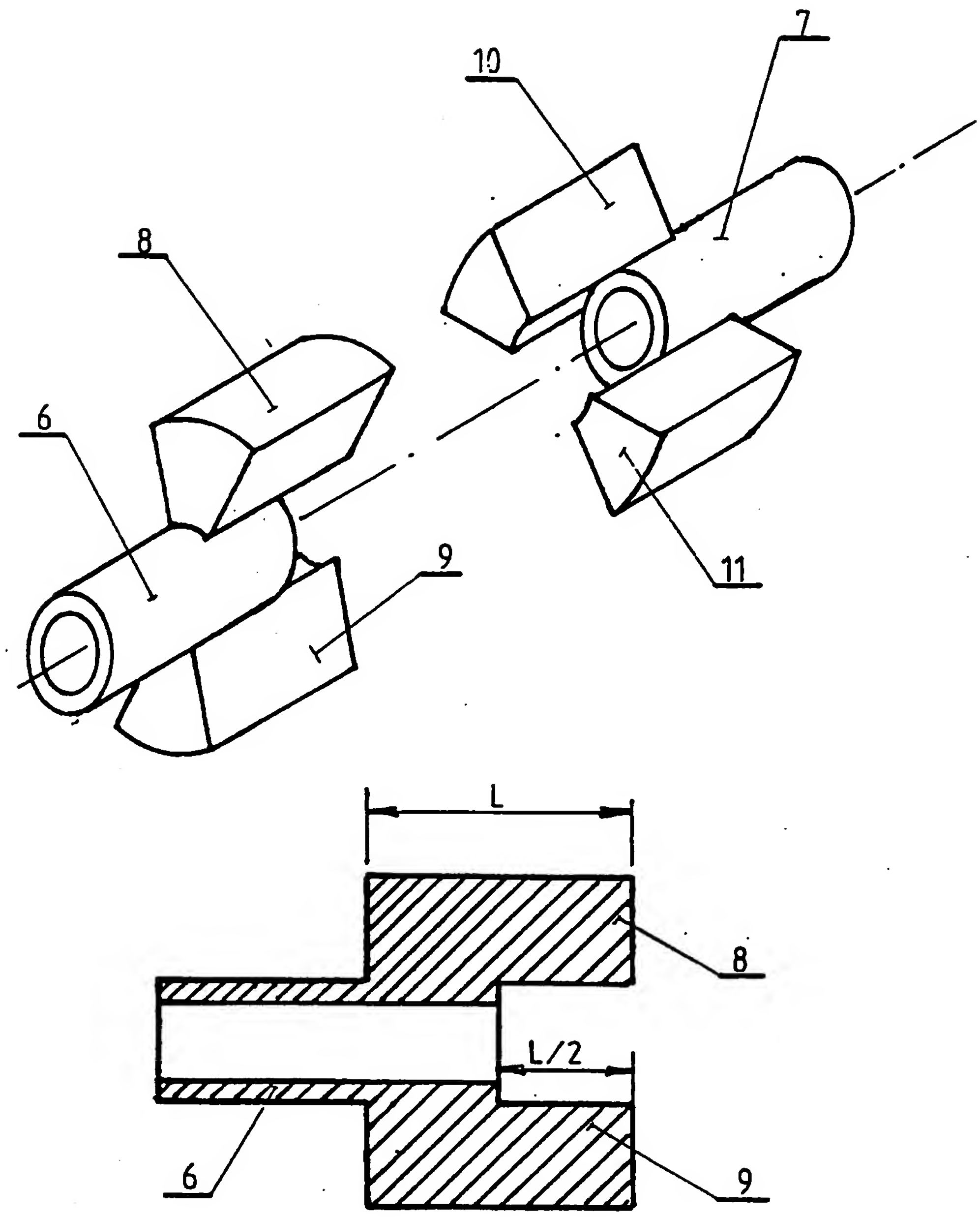


FIGURE 7

8/10

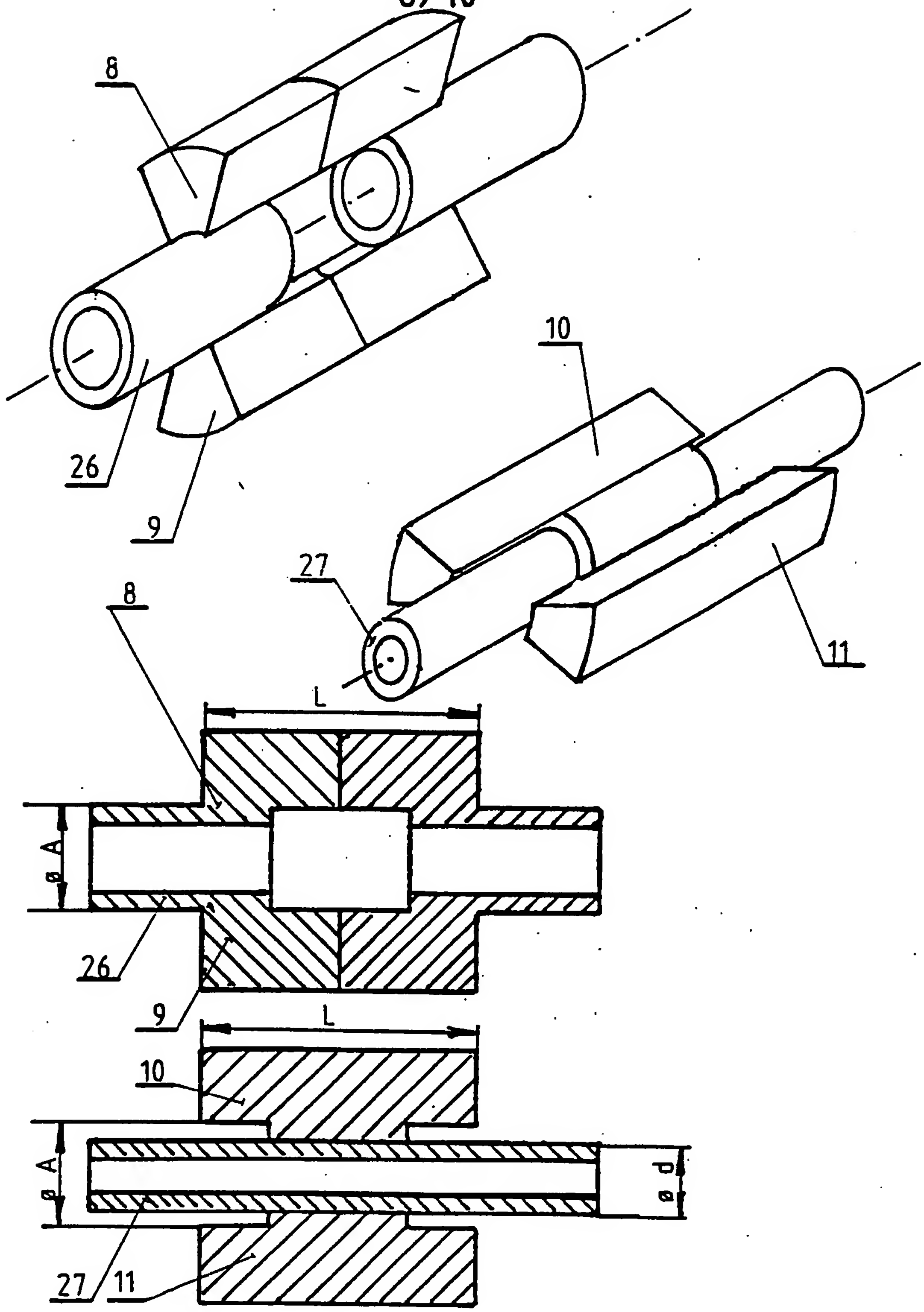


FIGURE 8

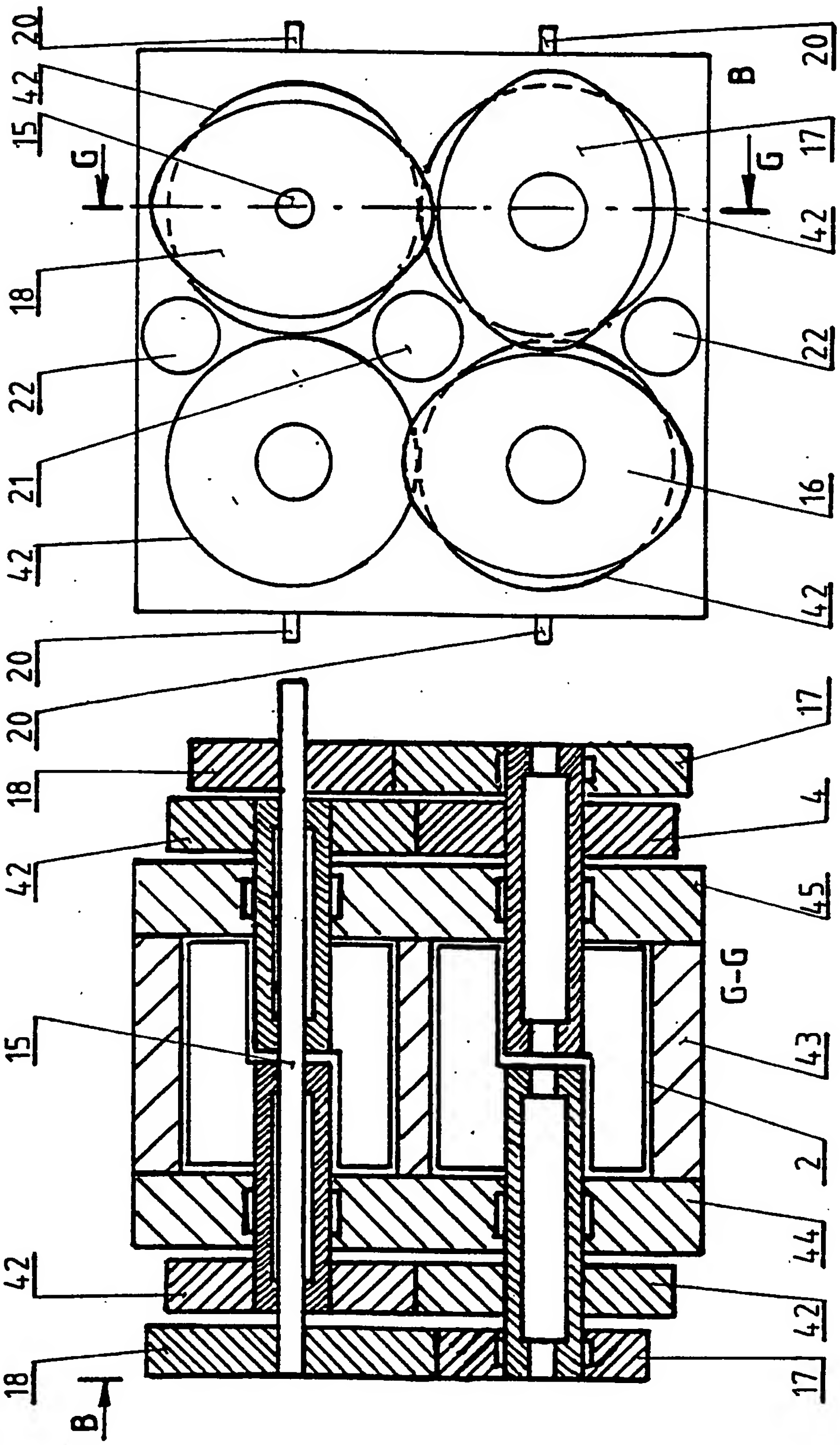

20
42
15
18
22
21
42
20
20
18
42
15
42
18
B
20
B
17
G
42
22
16
42
17
4
45
G-G
43
2
44
42
17

FIGURE 9

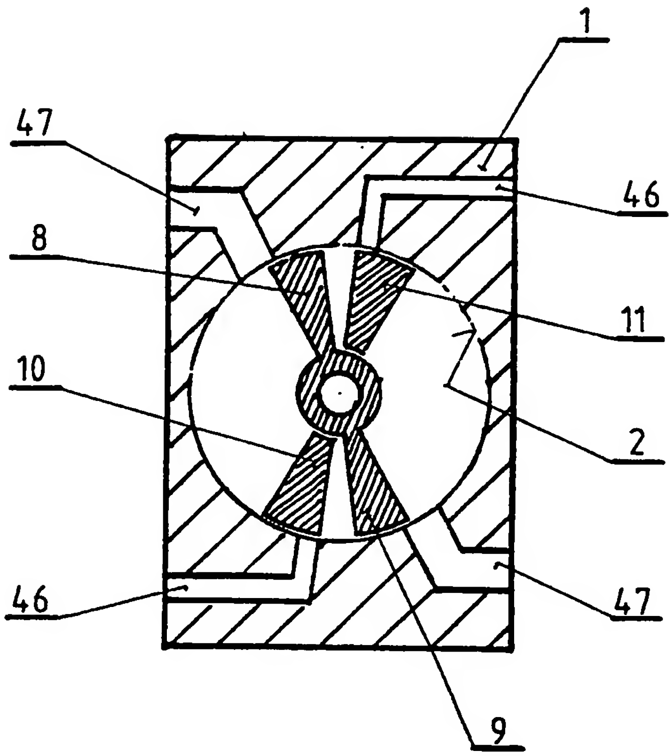


FIGURE 10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/HU 94/00059

A. CLASSIFICATION OF SUBJECT MATTER

IPC^6: F 01 C 1/063

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC^6: F 01 C 1/063, 1/067, 1/07, 1/073, 1/077; F 04 C 2/063, 2/067, 2/07, 2/073, 2/077, 18/063, 18/067, 18/07,1 18/073, 18/077; F 16 H 35/02; F 02 B 53/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	US 50 83 539 A (CORNELIO) 28 January 1992 (28.01.92), especially fig. 2-9.	1 2,6 3,4
X Y A	DE 24 43 290 A1 (MURONE) 13 March 1975 (13.03.75), especially page 2, line 11 - page 15, line 24; fig. 5-7.	1 2,6 3,4
X Y A	DE 15 76 912 A (KAUFMANN) 10 December 1970 (19.12.70), totality.	1 2,6 3,4
Y A	US 14 82 628 A (BULLINGTON) 05 February 1924 (05.02.24), especially page 1, line 105 - page 2, line 25.	2 1,4
Y	GB 21 38 094 A (CEFIN) 17 October 1984 (17.10.84), especially fig. 1,2; page 2, lines 11-100.	6
A	US 34 30 573 A (GROEGER) 04 March 1969 (04.03.69), especially fig. 3-5.	1,3,4

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 March 1995 (13.03.95)	20 March 1995 (20.03.95)

Name and mailing address of the ISA/ AT	Authorized officer
AUSTRIAN PATENT OFFICE Kohlmarkt 8-10 A-1014 Vienna	Fietz e.h.
Facsimile No. 1/53424/535	Telephone No. 1/53424/358

INTERNATIONAL SEARCH REPORT

International application No.
PCT/HU 94/00059

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 20 50 603 A (GARDNER) 11 August 1936 (11.08.36), especially fig. 2,3.	1-5
A	FR 21 47 390 A (LAMPSON) 09 March 1973 (09.03.73), especially fig. 1,2.	1,6

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/HU 94/00059

Im Recherchenbericht angeführtes Patentdokument / Patent document cited in search report / Document de brevet cité dans le rapport de recherche	Datum der Veröffentlichung / Publication date / Date de publication	Mitglied(er) der Patentfamilie / Patent family member(s) / Membre(s) de la famille de brevets	Datum der Veröffentlichung / Publication date / Date de publication
DE A1 4320722	10-02-94	keine - none - rien	
AT B 336664	25-05-77	AT A 1769/74	15-09-76
AT B 324393	25-08-75	AT B 316622	25-07-74
		BE A 727926	16-07-69
		CH A 493702	15-07-70
		DE A 1815645	16-10-69
		DE U 6812182	10-09-70
		DK B 131693	18-08-75
		DK C 131693	19-01-76
		ES Y 156663	16-02-79
		ES Y1 156663	14-03-79
		FR A 1595168	08-06-70
		GB A 1252167	03-11-71
		LU A 55865	25-04-69
		NL A 6818796	13-10-69
		NL B 158868	15-12-78
		NO B 127931	03-09-73
		SE B 347309	31-07-72
		US A 3603562	07-09-71
DE A1 3905199	23-08-90	keine - none - rien	
US A 4712764	15-12-87	keine - none - rien	

DERWENT-ACC-NO: 1995-240724

DERWENT-WEEK: 199850

TITLE: Rotary motions drive for IC engines - has ratios housing with two pairs of rotors rotatably mounted in cylindrical rotors area having shaft fastened to pairs of vanes divided into chambers

INVENTOR: JANOSI, M

PATENT-ASSIGNEE: JANOSI M[JANOI]

PRIORITY-DATA: 1993HU-0003737 (December 23, 1993)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
WO 9517582 A1	June 29, 1995	E	032	F01C 001/063
HU 215194 B	October 28, 1998	N/A	000	F01C 001/063
HU 72454 T	April 29, 1996	N/A	000	F01C 001/063

DESIGNATED-STATES: CA CN JP US AT BE CH DE DK ES FR GB GR IE IT LU MC NL PT SE

CITED-DOCUMENTS: DE 1576912; DE 2443290 ; FR 2147390 ; GB 2138094 ; US 1482628
; US 2050603 ; US **3430573** ; US 5083539

APPLICATION-DATA:

PUB-NO	APPL-DESCRIPTOR	APPL-NO	APPL-DATE
WO 9517582A1	N/A	1994WO-HU00059	December 8, 1994
HU 215194B	N/A	1993HU-0003737	December 23, 1993
HU 215194B	Previous Publ.	HU 72454	N/A
HU 72454T	N/A	1993HU-0003737	December 23, 1993

INT-CL (IPC): F01C001/063

ABSTRACTED-PUB-NO: WO 9517582A

BASIC-ABSTRACT:

An output shaft (15) is coupled with a rotor's shaft (6,7) by at least two oval gears, precisely. ONe of the oval gear (16) is mounted on the rotor's shaft (6) and the other the oval gear (18) being mounted on rotor's shaft (7). Two

oval gears (17,19) are mounted on the output shaft (15) and these oval gears (17,19) are positioned 90 deg. out of phase on the output shaft (15).

The oval gear (16) is coupled with oval gear (17,18,19). These connection have such formation, that provides an alternating movement between the two rotors and the connections can be direct or an additional oval gear can be inserted, e.g. the double oval gear (12). The rolling or pitch curve of these oval gears is the same.

ADVANTAGE - Determines and provides every main performance of the new rotary drive, and is inseparable from this new connection system.

CHOSEN-DRAWING: Dwg.2/10

TITLE-TERMS: ROTATING MOTION DRIVE IC ENGINE RATIO HOUSING TWO PAIR ROTOR
ROTATING MOUNT CYLINDER ROTOR AREA SHAFT FASTEN PAIR VANE DIVIDE
CHAMBER

DERWENT-CLASS: Q51

SECONDARY-ACC-NO:
Non-CPI Secondary Accession Numbers: N1995-187653